II

A FURTHER CONTRIBUTION TO THE MAMMALIAN FAUNA OF THE THOUSAND CREEK PLIOCENE, NORTHWESTERN NEVADA

BY JOHN C. MERRIAM AND CHESTER STOCK

WITH THREE PLATES AND FOURTEEN TEXT-FIGURES

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CONTENTS

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INTRODUCTION

Since publication of the description and discussion of the Thousand Creek fauna in 1911,[1] further collecting in the Thousand Creek beds of northwestern Nevada by parties from the University of California has furnished additional palæontological materials on which the recognition of forms new to the fauna has been based and on which previously described species have become better known.

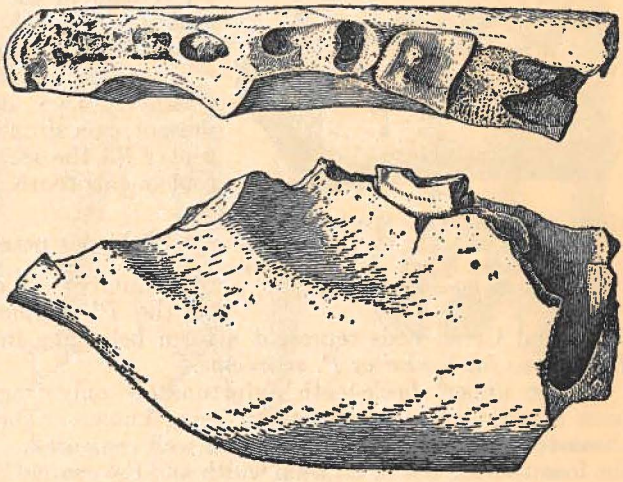


Fig. 1. *Ælurodon* sp. Mandibular fragment, No. 27248 U. C. Coll.; lateral and superior views, ×1.0. Thousand Creek Pliocene, Nevada.

While the relationships of the fauna were discussed some years ago,[2] a description of the newly obtained material, with the exception of the badger remains described by Butterworth,[3] has never been published.

The illustrations for this paper have been prepared by John L. Ridgway.

[1] J. C. Merriam, *Tertiary mammal beds of Virgin Valley and Thousand Creek in Northwestern Nevada, Pt. II: Vertebrate Faunas*, Univ. Calif. Publ. Bull. Dept. Geol., vol. 6, pp. 199–304, pls. 32–33, 1911.

[2] J. C. Merriam, *Relationships of Pliocene mammalian faunas from the Pacific Coast and Great Basin provinces of North America*, Univ. Calif. Publ., Bull. Dept. Geol., vol. 10, pp. 421–443, 1917.

[3] E. Butterworth, *A new mustelid from the Thousand Creek Pliocene of Nevada*, Univ. Calif. Publ., Bull. Dept. Geol., vol. 10, pp. 21–24, 1916.

DESCRIPTION OF MATERIAL

Ælurodon sp.

Two mandibular fragments, No. 27248 U. C. C. (fig. 1), represent a large type of dog, presumably related to the genus *Ælurodon* and comparable in size to *Æ. wheelerianus*. In this specimen the jaw is heavy, although of smaller size than the *Ælurodon* jaws from the Ricardo which have been referred provisionally to *Æ. aphobus*. Unfortunately all that remains of the lower dentition is the broken part of the heel of $M\bar{1}$. The heel region of this tooth narrows posteriorly as in *Æ. wheelerianus*.

Pseudælurus? sp.

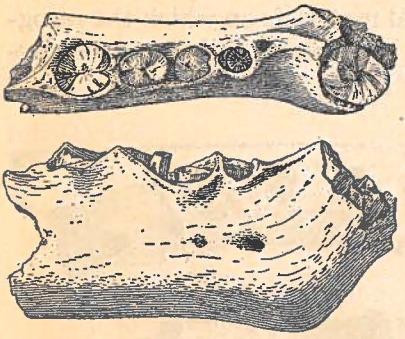


Fig. 2. *Pseudælurus*? sp. Mandibular fragment, No. 27247 U. C. Coll.; lateral and superior views, ×1.0. Thousand Creek Pliocene, Nevada.

An anterior portion of a ramus, No. 27247 U. C. C. (fig. 2), appears to belong to *Pseudælurus*. This specimen is distinctly smaller than the type of *P. intrepidus* Leidy. The roots of $P\bar{3}$ and $P\bar{4}$ remain in the jaw. In front of the anterior root of $P\bar{3}$ is a very small alveolus for a single-rooted tooth. The root of the canine is flattened transversely. Two mental foramina are present, one situated below the anterior root of $P\bar{3}$, the second below the posterior root of this tooth.

Pliohippus near fairbanksi Merriam

A number of cheek-teeth of horses of the *Pliohippus* type found in the Thousand Creek beds represent a form belonging in or near the group of *Pliohippus fairbanksi* or *P. supremus*.

Of the upper cheek-teeth unfortunately only fragmentary material has been secured, no complete teeth being known. The crowns of the upper cheek-teeth are strongly curved and well cemented. In the teeth available the fossettes are not of unusual width and the enamel border is comparatively little folded. The most important folds are those at the postero-internal angle of the anterior fossette. These folds taken with the type of the post-protoconal fold indicate that the nature of the union between protoloph and metaloph was much as in *P. fairbanksi*. The complete protocone is not known; so far as can be determined it was small and only slightly compressed laterally. So far as the characters of the upper cheek-teeth are concerned this species seems to belong nearer to the *P. fairbanksi* type as represented in the Ricardo and Rattlesnake forms than to any other species, unless it be *P. supremus*.

Pliohippus sp.

Several lower cheek-teeth from the Thousand Creek beds represent a *Pliohippus* of a type near *P. fairbanksi* of the Ricardo Pliocene. These teeth are long crowned and very heavily cemented. The outer walls of the protoconid and paraconid are convex. The metaconid-metastylid column is short anteroposteriorly and its inner gutter tends to be angular. Specimen

22423, including $P\frac{2}{2}$ to $P\frac{4}{4}$ and an associated $M\frac{3}{3}$ (fig. 3a, b), closely resembles No. 21346 from the Ricardo and No. 22388 from the Rattlesnake. The latter specimen has been referred to *Pliohippus spectans* (Cope). The $M\frac{3}{3}$ associated with the premolars in the specimen from Thousand Creek also closely resembles the corresponding tooth of No. 22388 from the Rattlesnake.

A $M\frac{2}{2}$ from another locality, No. 2745, shows some resemblance to that of a Ricardo species, No. 21789, referred to *P. tantalus*, but its similarity to the *P. fairbanksi* form of the Rattlesnake might be as close if a specimen of corresponding stage of wear were available for comparison.

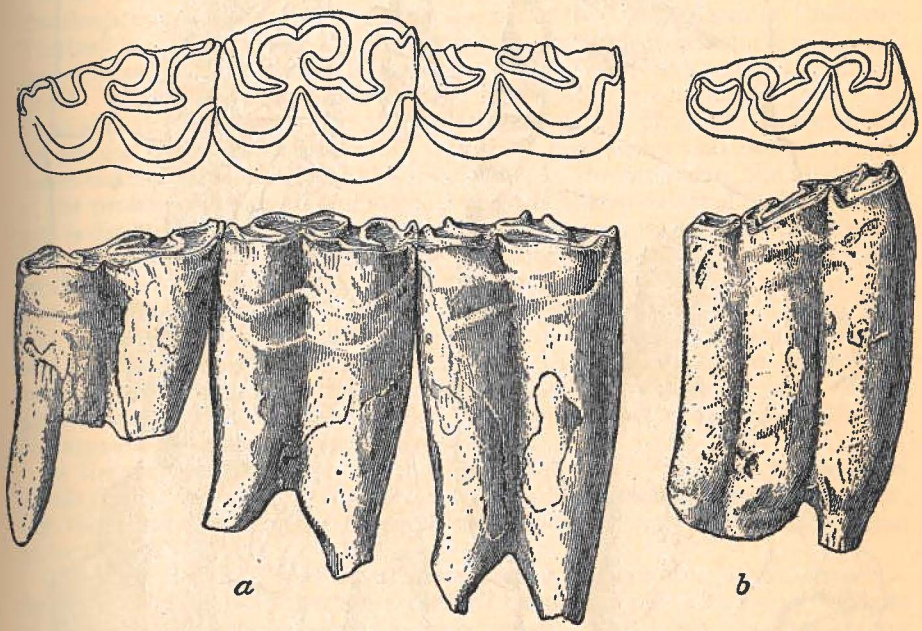


Fig. 3. *Pliohippus* sp. Lower cheek-teeth, No. 22423 U. C. Coll.; lateral and occlusal views, ×1.0. *a*, $P\frac{2}{2}$ to $P\frac{4}{4}$; *b*, $M\frac{3}{3}$. Thousand Creek Pliocene, Nevada.

Measurements (in millimeters) of No. 22423

$P\frac{2}{2}$, antero-posterior diameter	26.
$P\frac{2}{2}$, greatest transverse diameter	16.
$P\frac{3}{3}$, antero-posterior diameter	26.1
$P\frac{3}{3}$, greatest transverse diameter	18.3
$P\frac{4}{4}$, antero-posterior diameter	26.2
$P\frac{4}{4}$, transverse diameter	
$M\frac{3}{3}$, antero-posterior diameter	30.
$M\frac{3}{3}$, greatest transverse diameter	11.4

Hipparion (Neohipparion) leptode Merriam

A fragmentary skull and lower jaw of a *Hipparion*, No. 27126 U. C. Coll., found by Miss Annie M. Alexander and Miss Louise Kellogg in the Thousand Creek beds in 1920 give a nearly complete representation of the upper and lower dentition. Associated with this specimen and undoubtedly belonging to the same individual are the remains of its front feet.

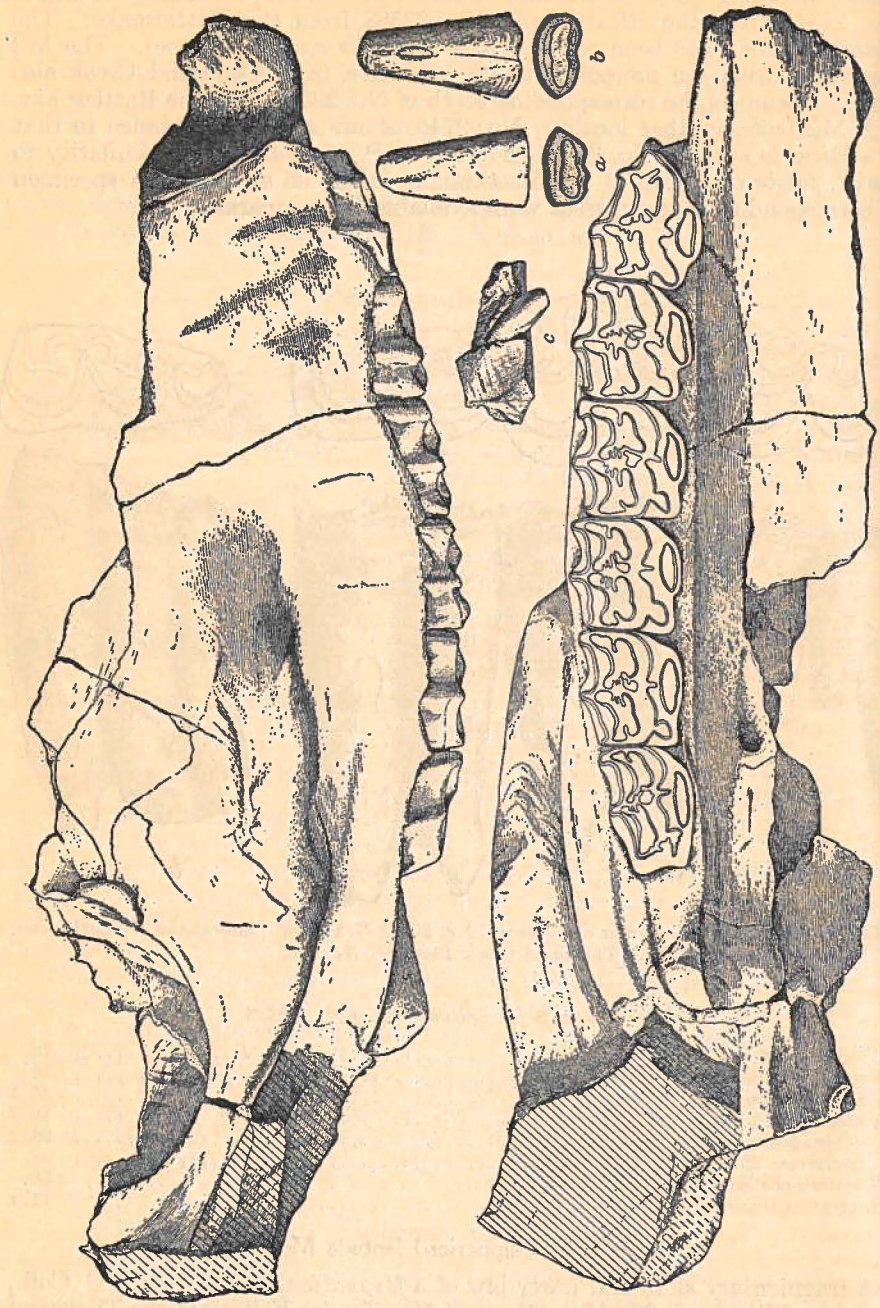


Fig. 4. *Hipparion* (*Neohipparion*) *leptode* Merriam. Skull fragment and superior dentition, No. 27126 U. C. C.; lateral and inferior views, ×0.66. *a* and *b*, superior incisors; *c*, superior canine. Thousand Creek Pliocene, Nevada.

In No. 27126 only a small portion of the lower orbital rim is preserved. Below and anterior to this border the crista facialis extends forward and is perhaps somewhat accentuated as a result of little crushing to which the side of the face has been subjected. The crista descends and disappears above the anterior end of M1. Malar and lachrymal fossæ are not defined. The surface of the maxillary anterior to P2 and above the palatal border forms a deep concavity (fig. 4).

The palatal portion of the skull is likewise poorly preserved. The posterior palatine foramen lies opposite the anterior end of M3. The maxillary tubercle is not large and separates a broad groove situated along its inner side from a short and narrow groove behind the last molar.

With the possible exception of *Hipparion mohavense* from the Ricardo, the dentition of no other *Hipparion* species of the Great Basin or California Tertiary is as completely known as that in the present specimen. A single upper incisor, I2?, is shown in figure 4*a*. The upper canine (fig. 4*c*), is very small. The upper cheek-tooth series, P2 to M3, is completely preserved. P1 is absent. The teeth (fig. 4) are well cemented. They are characterized by having large and considerably elongated protocones and rather complicated enamel folds bordering the fossettes. In the premolars the inner wall of the protocone tends to be flattened and the antero-external end is pointed and is directed outward and forward toward the inner wall of the protoconule. The anteroposterior diameter of the protocone is more than twice as great as the transverse diameter. The hypocone is small. The pli caballin projects inward and slightly forward in M3, directly inward in M2 and M1, and inward and backward in P4. In P3 and in P2 this structure is broadened and shows evidence of division. Although the enamel borders of the fossettes show numerous plications, particularly the posterior border of the pre-fossette and the anterior border of the post-fossette, the pattern is not as complex as that in *Hipparion mohavense*.

In the fragmentary upper tooth,[4] No. 12581 U. C. C., found at the same locality with the type of *Hipparion leptode*, the fossettes are quite narrow, but this character may not be emphasized more strongly in No. 12581 than in teeth of No. 27126.

The lower dentition and the anterior portion of the lower jaw are shown in figure 5. The incisors that are preserved have large pits with heavy deposits of cement. The lower canine is very small. The lower cheek-teeth are narrow and also heavily cemented. The metaconid-metastylid column is long anteroposteriorly, with a broad longitudinal furrow in the posterior premolars and in the molars. This groove deepens in the premolar series from P2 to P4 and remains deep in the molar teeth. The furrow is distinctly deeper and wider than in lower teeth of *Hipparion mohavense*. In the premolars the entoconid is long anteroposteriorly and its anterior end is pointed. In all the cheek-teeth, with the exception of M3, the hypoconulid (of Osborn) projects distinctly beyond the inner wall of the entoconid. The outer walls of protoconid and hypoconid tend to be flattened. A small fold is present at the antero-external angle of the tooth except in P2. In addition to this fold a strong external ridge at the anterior end of the hypoconid is present. This ridge is particularly prominent in P4. In the premolars it projects directly outward, in the posterior molars outward and slightly forward.

Relationship of No. 27126—In both the type of *H. leptode*, No. 19414 U. C. C., and No. 27126 the lower tooth-crown is narrow and slender, with

[4] J. C. Merriam, Univ. Calif. Publ. Bull. Dept. Geol., vol. 6, p. 263, figs. 32*a*, 32*b*, 1911.

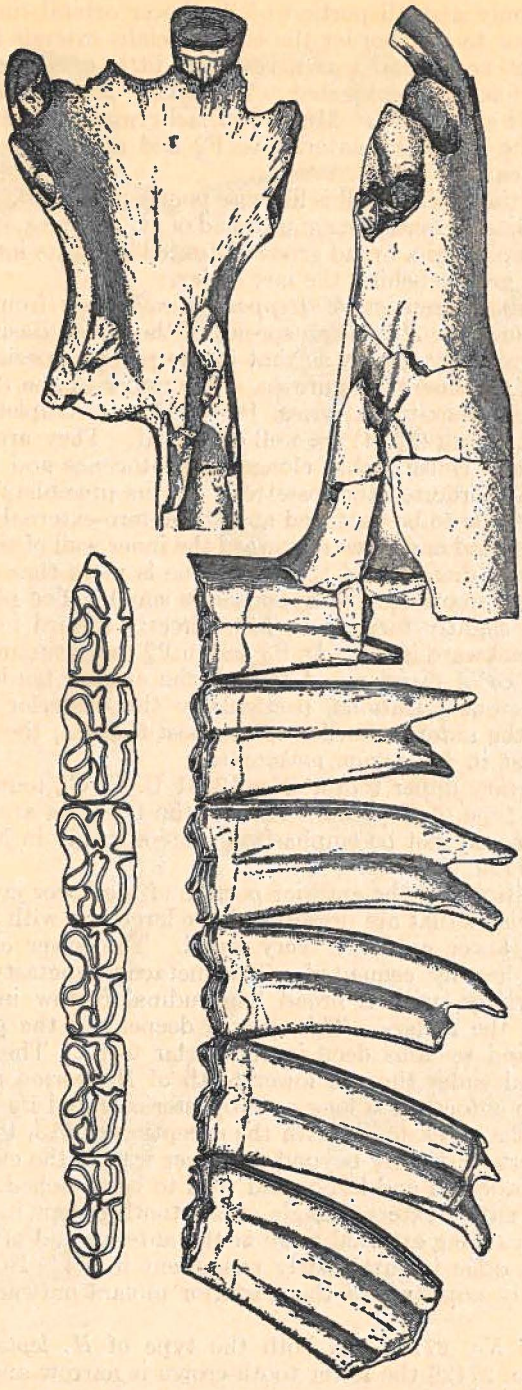


Fig. 5. *Hipparion* (*Neohipparion*) *leptode* Merriam. Mandibular fragment and lower dentition, No. 27126 U. C. C.; lateral and superior views, ×0.66. Thousand Creek Pliocene, Nevada.

the metaconid-metastylid column and inner furrow revealing similar characters. In both specimens, also, a strong external ridge is present on the hypoconid as well as at the anterior end of the protoconid. There appears little reason for doubting, therefore, the specific identity of the two forms. The lower tooth described by Merriam[5] as the type of this species was regarded as representing M$\bar{2}$. A comparison of the tooth with the complete set of molar teeth in No. 27126 indicates that No. 19414 resembles M$\bar{3}$ rather than M$\bar{2}$ in certain of its characters, as for example in narrowness of the tooth-crown, in posterior elongation of the hypoconulid, and in, perhaps, the attitude of the external ridge of the hypoconid. It appears quite possible, therefore, that the type of *H. leptode* is a third lower molar.

The *Hipparion* species of the Ricardo horizon have uniformly smaller and less elongated protocones. The nearest approach among the Great Basin hipparions is in the Rattlesnake Pliocene forms, among which compressed and elongated protocones predominate. *H. sinclairii* of the Rattlesnake may have a large and strongly compressed protocone, but teeth referred to this species may be smaller than No. 27126. Several specimens from the Rattlesnake fauna referred to *H. occidentale* have dimensions comparable to those of No. 27126 and show compression of protocone combined with complication of enamel folds. Among these specimens are lower teeth that clearly bear a close resemblance to comparable teeth in *H. leptode*. It seems not improbable that *Hipparion leptode, H. sinclairii* and *H. occidentale* represent a group of very closely related species.

Measurements (in millimeters) of dentition, No. 27126

I$\underline{1}$, greatest transverse diameter	15.4
I$\underline{2}$?, greatest transverse diameter	16.6
C$\underline{}$, greatest anteroposterior diameter	4.7
P$\underline{2}$, anteroposterior diameter	27.1
P$\underline{2}$, greatest transverse diameter	20.7
P$\underline{3}$, anteroposterior diameter	24.2
P$\underline{3}$, greatest transverse diameter	23.1
P$\underline{4}$, anteroposterior diameter	22.8
P$\underline{4}$, greatest transverse diameter	22.5
M$\underline{1}$, anteroposterior diameter	23.
M$\underline{1}$, greatest transverse diameter	22.6
M$\underline{2}$, anteroposterior diameter	22.3
M$\underline{2}$, greatest transverse diameter	21.
M$\underline{3}$, anteroposterior diameter	22.7
M$\underline{3}$, transverse diameter	17.3
Length of upper cheek-tooth series, P$\underline{2}$ to M$\underline{3}$	141.
I$\bar{1}$, transverse diameter	14.3
I$\bar{3}$, greatest diameter	12.1
C$\bar{}$, anteroposterior diameter	4.1
P$\bar{2}$, anteroposterior diameter	24.8
P$\bar{2}$, greatest transverse diameter	13.
P$\bar{3}$, anteroposterior diameter	23.8
P$\bar{3}$, greatest transverse diameter	14.5
P$\bar{4}$, anteroposterior diameter	23.7
P$\bar{4}$, greatest transverse diameter	14.4
M$\bar{1}$, anteroposterior diameter	22.8
M$\bar{1}$, greatest transverse diameter	13.
M$\bar{2}$, anteroposterior diameter	24.2
M$\bar{2}$, greatest transverse diameter	12.6
M$\bar{3}$, anteroposterior diameter	25.
M$\bar{3}$, greatest transverse diameter	10.4
Length of lower cheek-tooth series, P$\bar{2}$ to M$\bar{3}$	144.3

[5] J. C. Merriam, Univ. Calif. Publ. Bull. Dept. Geol., vol. 9, pp. 3–5, fig. 3, 1915.

Associated with the skull and lower jaw of No. 27126 are the remains of the two front feet. An incomplete specimen representing the right front foot of *Hipparion leptode* is shown in Plate I, figures 1 and 2. Unfortunately metacarpals II and III are not entirely preserved, but the fragments which remain indicate conclusively that the elements flanking metacarpal III were completely formed and carried side toes. One of the lateral digits occurs in the collection. It is shown in Plate I, figure 4, as representing the fourth digit of the right front foot.[6]

The carpus includes the magnum, lunar, pisiform and cuneiform. In the magnum (fig. 6*a*, *b*, *c*) the anterior portion of the articulating surface for the scaphoid is relatively broad anteroposteriorly. The posterior end of the lunar facet does not bend downward as much as in *Equus*. The opposite surface for the metapodial, as shown in figure 6*c*, has a somewhat different shape from that in *Equus*. The upper anterior facet for the trapezoid is noticeably concave in its longest diameter. No posterior facet for the trapezoid is present. In anterior view the lunar is seen to be slightly less wedge-shaped than in *Equus*, and the element is less constricted through its middle than in the latter genus. The facet for the unciform is relatively broader than in *Equus*. The posterior knob or process above the facet for

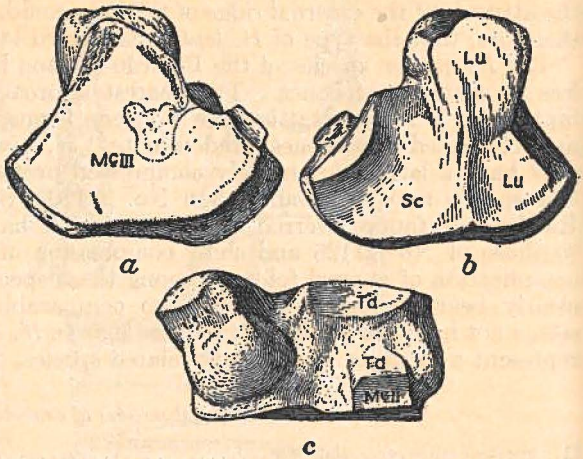


Fig. 6. *Hipparion* (*Neohipparion*) *leptode* Merriam. Left magnum, No. 27126 U. C. C.; ×1.0. *a*, distal view; *b*, proximal view; *c*, inner view, showing facets McIII for metacarpal III, Sc, for scaphoid, Lu, for lunar, Td, for trapezoid, and McII for metacarpal II. Thousand Creek Pliocene, Nevada.

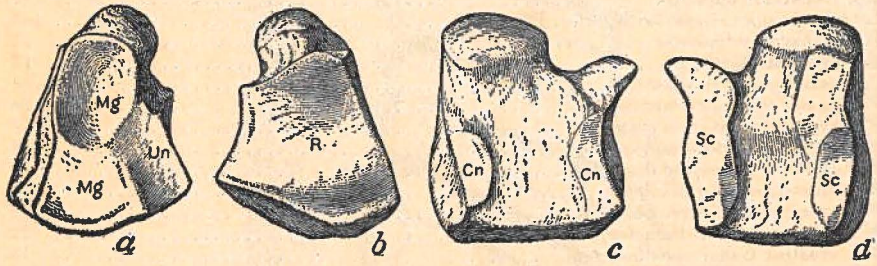


Fig. 7. *Hipparion* (*Neohipparion*) *leptode* Merriam. Right lunar, No. 27126 U. C. C.; ×1.0. *a*, distal view; *b*, proximal view; *c*, outer view; *d*, inner view, showing facets Mg, for magnum, Un, for unciform, R, for radius, Cn, for cuneiform, and Sc, for scaphoid. Thousand Creek Pliocene, Nevada.

[6] The possibility that the digit is the second of the left front foot does not appear, however, to be entirely eliminated.

the magnum is less prominently developed in the Pliocene form than in *Equus*. The cuneiform and pisiform are shown in figure 8.

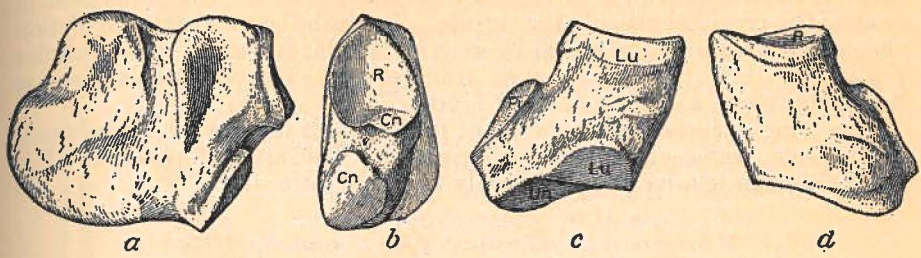


Fig. 8. *Hipparion* (*Neohipparion*) *leptode* Merriam. *a* and *b*, right pisiform, views of outer side and articulating end showing facets R, for radius, *Cn*, for cuneiform. *c* and *d*, left cuneiform, outer and inner views showing facets Lu, for lunar, Un, for unciform, and Pi, for pisiform; ×1.0. No. 27126 U. C. C. Thousand Creek Pliocene, Nevada.

Metacarpal III is a slightly longer but decidedly stouter element than that of *Hipparion whitneyi*. At the proximal end the plane of the unciform surface makes an angle of 46° with that of the magnum facet. The shaft increases slightly in width downward from the end of the proximal fourth. In broadness of shaft this element differs somewhat from that in *H. whitneyi*. On the posterior face of the distal articulating surface the lower limits of contact between this surface and the sesamoid bones are plainly marked. The median keel in this region is sharp, while in front it becomes rounded.

The side elements, metacarpals II and IV, are completely developed although not entirely preserved in No. 27126. In *H. whitneyi* the shaft of the lateral metapodials becomes of splint-like proportions in the lower three-quarters of its total length, although the lower end expands and supports a lateral digit. In *H. leptode* the shaft of the lateral metapodials is more strongly developed, thus reflecting in this respect also the greater robustness of the foot as contrasted with that of the Great Plains species. While no facet is recognized at the proximal end of metacarpal II in No. 27126 suggesting the presence of a rudiment of metacarpal I, a relatively large facet is present on the fourth metapodial for a rudimentary fifth element.

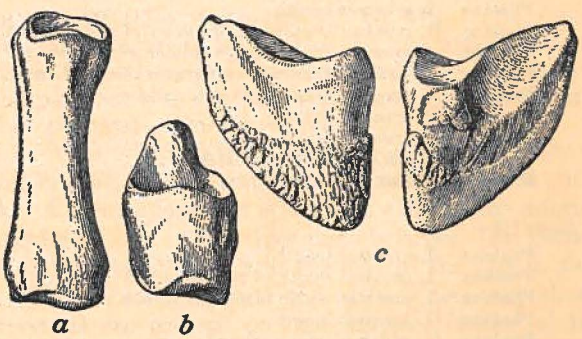


Fig. 9. *Hipparion* (*Neohipparion*) *leptode* Merriam. Lateral digit of manus, No. 27126 U. C. C.; ×1.0. *a*, phalanx I, superior view; *b*, phalanx II, superior view; *c*, phalanx III, superior and inferior views. Thousand Creek Pliocene, Nevada.

The single lateral digit consisting of three phalanges present in the collection has essentially the characters seen in *H. whitneyi*. The individual

elements are distinctly larger than in the latter species. In phalanx II the outer half of the posterior lower margin is drawn backward to form the border of a distinct process. In phalanx III the outer portion of the segment is carried backward to form a thin plate of bone lying below and in back of the proximal articulating surface. Beneath the proximal articulation the ventral surface is perforated by several vascular foramina. The anterior portion of this surface is convex transversely. The superior surface is decidedly rugose along the anterior border.

Excepting size, the phalanges of the median digit again show resemblance to the comparable elements in *H. whitneyi*. The apex of phalanx III is cleft, although relatively not as deeply as in the latter form.

Measurements (in millimeters) of foot elements, No. 27126

Carpals—	
Magnum, greatest transverse diameter	35.3
Magnum, greatest anteroposterior diameter	30.8
Magnum, greatest dorso-ventral diameter	18.9
Lunar, greatest transverse diameter	24.
Lunar, greatest anteroposterior diameter	27.8
Lunar, greatest dorso-ventral diameter	25.8
Cuneiform, dorso-ventral diameter	21.7
Pisiform, greatest length through middle	38.7
Metacarpal II—	
Greatest diameter of proximal end	17.8
Greatest diameter of distal articulating end	18.2
Transverse diameter of distal articulation	9.3
Metacarpal III—	
Greatest length	228.2
Width of proximal end	38.5
Anteroposterior diameter of proximal end	28.2
Transverse diameter at middle of shaft	25.9
Anteroposterior diameter at middle of shaft	21.5
Transverse diameter of distal end	34.7
Anteroposterior diameter through median keel	29.6
Metacarpal IV—	
Greatest diameter of proximal end	18.
Lateral digit—	
Phalanx I, greatest length	39.1
Phalanx II, greatest transverse diameter of proximal end	13.
Phalanx I, greatest dorso-ventral diameter of proximal end	18.2
Phalanx I, greatest transverse diameter of distal end	13.
Phalanx II, greatest length through middle	15.7
Phalanx II, greatest width	14.8
Phalanx III, greatest width	21.2
Phalanx III, dorso-ventral diameter	15.5
Phalanx III, length	30.5
Digit III—	
Phalanx I, greatest length	67.
Phalanx I, greatest depth of proximal end	29.3
Phalanx I, greatest width of proximal end	38.
Phalanx II, greatest length	38.7
Phalanx II, width of proximal end	37.4
Phalanx III, greatest length	60.8
Phalanx III, greatest width	56.7
Phalanx III, greatest dorso-ventral diameter	34.

Fig. 10. *Hipparion leptode* Merriam or *H. occidentale* Leidy?. Upper cheek-tooth, No. 22380 U. C. C.; lateral and occlusal views, ×1.0. Thousand Creek Pliocene, Nevada.

Hipparion leptode Merriam or H. occidentale Leidy?

A single upper cheek-tooth, No. 22380 (fig. 10), represents a *Hipparion* form similar in size to No. 27126. The occlusal surface exhibits a large and elongated protocone and the enamel borders of the fossettes show slightly more complicated folds than in No. 27126. A short spur of enamel suggests a pli caballin. While the protocone is comparable in length to that in teeth of No. 27126, it is noticeably wider transversely than in the latter specimen.

No. 22380 may represent *H. leptode* or may be referred provisionally to *H. occidentale.*

Measurements (in millimeters) of No. 22380

Anteroposterior diameter	24.3
Transverse diameter	22.3
Anteroposterior diameter of protocone	9.8

Teleoceras fossiger (Cope)

Rhinocerotid remains are abundantly represented in the collections from Thousand Creek, but the material usually represents fragmentary and incomplete parts of the skeleton.

A fragmentary skull and lower jaw with dentition, No. 22901, furnishes perhaps the most satisfactory evidence on which determination of the Thousand Creek type can be based. Unfortunately only a small portion of the face and a part of the zygomatic arch remain in the skull of this form (Plate 2), but the cheek teeth are fairly well preserved. The jugal is heavy and deepens posteriorly. The antorbital foramen is situated at a relatively short distance in front of the maxillo-jugal suture and lies above the anterior end of P$\underline{3}$. The nasals, shown in figure 11*a*, *b*, *c*, are slender and narrow anteriorly. While similar in character to those of *Teleoceras* described by Matthew,[7] the nasals in the Thousand Creek form do not possess a distinctly rugose upper surface of the anterior end.

The upper dentition in No. 22901 consists of P$\underline{2}$ to M$\underline{3}$. The molar series is noticeably longer than the premolar series. In the premolars and in the first molar the pre- and postfossettes are closed and the prefossette is distinctly larger than the postfossette. In M$\underline{2}$ well-developed crochet and antecrochet are present, but the crista seems to be absent.

Only the anterior portion of the lower jaw is present, but the lower dentition is well preserved (see plate 3). The symphysis reaches back to a point opposite the middle of P$\overline{4}$. A mental foramen is situated close to the inferior border and below the middle of P$\overline{4}$. The diastema between the incisor tusk and the anterior premolar is very short and the side of the jaw in this region is deeply concave. The distance between the tusks is also very short. Very small, shallow depressions are present on the anterior border of the symphysis.

[7] W. D. Matthew, Bull. Amer. Mus. Nat. Hist., vol. 38, p. 202, fig. 9c, 1919.

The lower tusk is large and sweeps upward in a decided curve, the tip reaching a point well above the level of the tooth-row. The worn surface of this tooth is well shown in Plate 3. The lower cheek teeth include $P\frac{3}{3}$ to $M\frac{3}{3}$, with a remnant of a root representing probably a rudimentary $P\frac{2}{2}$.

A number of foot-bones in the collections from Thousand Creek belong without much doubt to the short-footed *Teleoceras*. The metapodials exhibit characters very close to those seen in comparable elements of the Great Plains species.

The rhinocerotid types of the Ricardo deposits, Mohave Desert, California, are clearly distinguishable from the Thousand Creek genus. These forms

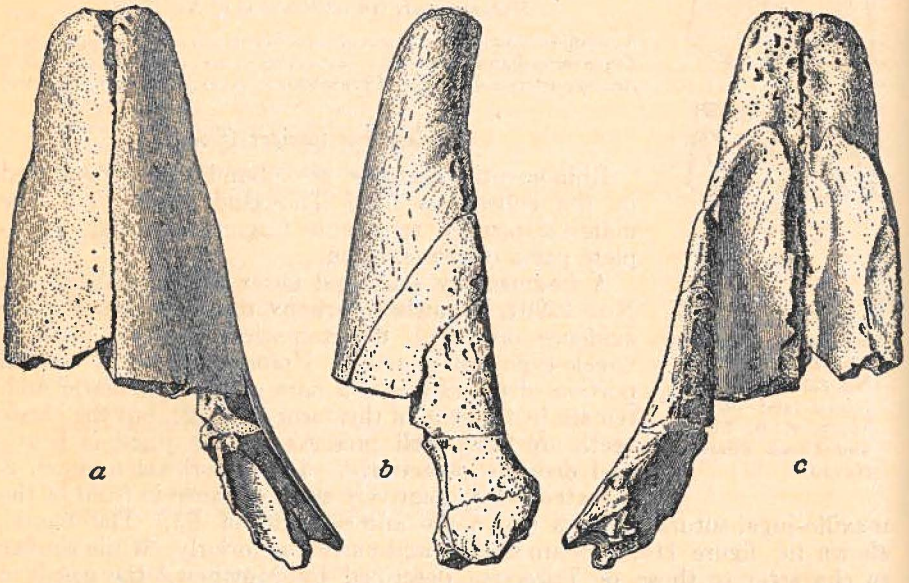


Fig. 11. *Teleoceras fossiger* (Cope). Nasals, No. 22901 U. C. C.; ×0.50. *a*, superior, *b*, lateral, *c*, inferior view. Thousand Creek Pliocene, Nevada.

have been described as belonging to *Aphelops* and to *Peraceras?*. The lower jaw from the Ricardo which has been provisionally referred to *Peraceras*[8] differs decidedly from *Teleoceras* in the greatly shortened symphyseal region and in the absence of a lower tusk. The presence of these forms in the Ricardo fauna and the absence of *Teleoceras* may be taken as a further indication of the faunal difference which exists between the Ricardo and Thousand Creek horizons.

It appears quite possible that several distinct rhinocerotid genera occur in the Rattlesnake fauna. Metapodials of short-footed forms having considerable resemblance to those of *Teleoceras fossiger* are known from the Rattlesnake deposits.

[8] C. Stock and E. L. Furlong, Univ. Calif. Publ. Bull. Dept. Geol. Sci., vol. 16, pp. 50–51, pl. 10, 1926.

Measurements (in millimeters) of dentition, No. 22901

$P\underline{2}$, anteroposterior diameter	30.9
$P\underline{2}$, transverse diameter	35.
$P\underline{4}$, anteroposterior diameter	47.2
$P\underline{4}$, transverse diameter	64.3
$M\underline{1}$, anteroposterior diameter	51.9
$M\underline{1}$, transverse diameter	65.4
Length from anterior end of $P\underline{2}$ to posterior end of $M\underline{1}$	146.3
Lower tusk, greatest anteroposterior diameter at base of worn surface	28.4
Lower tusk, greatest transverse diameter at base of worn surface	56.4
$P\overline{3}$, anteroposterior diameter	*a*34.
$P\overline{3}$, transverse diameter	28.2
$P\overline{4}$, anteroposterior diameter	40.9
$P\overline{4}$, transverse diameter	29.3
$M\overline{1}$, anteroposterior diameter	42.6
$M\overline{1}$, transverse diameter	*a*29.2
$M\overline{2}$, anteroposterior diameter	*a*48.6
$M\overline{2}$, transverse diameter	....
$M\overline{3}$, anteroposterior diameter	52.
$M\overline{3}$, transverse diameter	30.
Length from anterior end of $P\overline{3}$ to posterior end of $M\overline{3}$	*a*214.

In measuring the individual cheek-teeth the greatest diameters have been taken.
a, approximate.

Prosthennops sp.

Little additional peccary material has been obtained since the original description of the fragments of the dentition from the Thousand Creek beds.[9]

Three premolar teeth and a portion of the maxillary, No. 30040 Mus. Pale. Univ. Calif. Coll., are shown in figure 12. The specimens were found at Locality 2744 U. C. Mus. Pale. The teeth represent $P\underline{2}$ and $P\underline{3}$ of the right side and $P\underline{4}$ of the left.

$P\underline{2}$ is a relatively large tooth, rudely triangular in shape. Two cusps are present on the outer side of the crown and are separated by a cleft which extends outward, backward and upward. An inner posterior cusp or incipient cusp is also present and a cingulum extends along the inner side. In the presence of three cusps this tooth is apparently like that of *Prosthennops serus* (Cope) from the Upper Snake Creek. In possessing a greater number of cusps $P\underline{2}$ differs from No. 11876 U. C. C., a tooth described from the Thousand Creek beds by Merriam[10] and provisionally regarded as $P\underline{2}$.

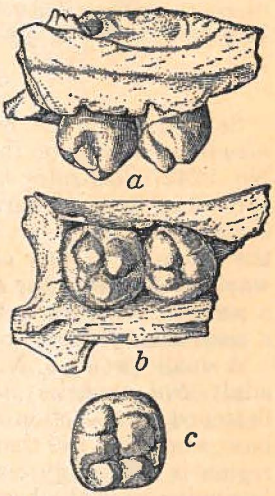


Fig. 12. *Prosthennops* sp. Maxillary fragment with $P\underline{2}$, $P\underline{3}$, and $P\underline{4}$, No. 30040 U. C. C.; ×1.0. *a*, lateral view, *b*, occlusal view, *c*, occlusal view of $P\underline{4}$. Thousand Creek Pliocene, Nevada.

$P\underline{3}$ has three principal cusps of which the inner anterior one is the largest. The outer anterior cusp is larger than the outer posterior cusp. A cuspule of minor size lies in the region to the inner side of the outer posterior cusp and behind the inner anterior cusp. The posterior cingulum is well developed. $P\underline{3}$ resembles in shape, and in a measure also in the arrangement of the tubercles the tooth, No. 11876, provisionally regarded by Merriam[11] as $P\underline{3}$ of *Prosthennops* from the Thousand Creek.

[9] J. C. Merriam, Univ. Calif. Publ. Bull. Dept. Geol., vol. 6, pp. 272–275, figs. 52 to 53a, b, c, 1911.
[10] J. C. Merriam, *op. cit.*, fig. 53*a*, p. 273, 1911.
[11] J. C. Merriam, *op. cit.*, fig. 53*b*, p. 273, 1911.

In *P. serus* from the Snake Creek, P3, according to Matthew, has four main cusps.

The crown of P4 (fig. 12*c*), accompanying the maxillary fragment at Locality 2744 represents the tooth of the left side. This tooth is quadrate in shape and possesses an anterior transverse row of two cusps and a posterior transverse row of three cusps. The increase to three cusps in the posterior row is due apparently to a division of the inner posterior cusp into two parts. A cingulum is present at the antero-internal corner and likewise at the postero-external corner of the tooth.

The maxillary fragment in No. 30040 U. C. C. includes small portions of the palate and face. The palatal portion is traversed by a canal. The facial portion exhibits the furrow or depression leading to the infraorbital foramen. In this depression and at a point above the anterior end of P3 is the opening of a nutrient canal leading into the root region of the anterior premolars.

Measurements (in millimeters) of No. 30040 U. C. C.

P2, greatest anteroposterior diameter	9.3
P2, greatest transverse diameter	10.
P3, greatest anteroposterior diameter	10.9
P3, greatest transverse diameter	11.1
P4, greatest anteroposterior diameter	12.2
P4, greatest transverse diameter	12.5

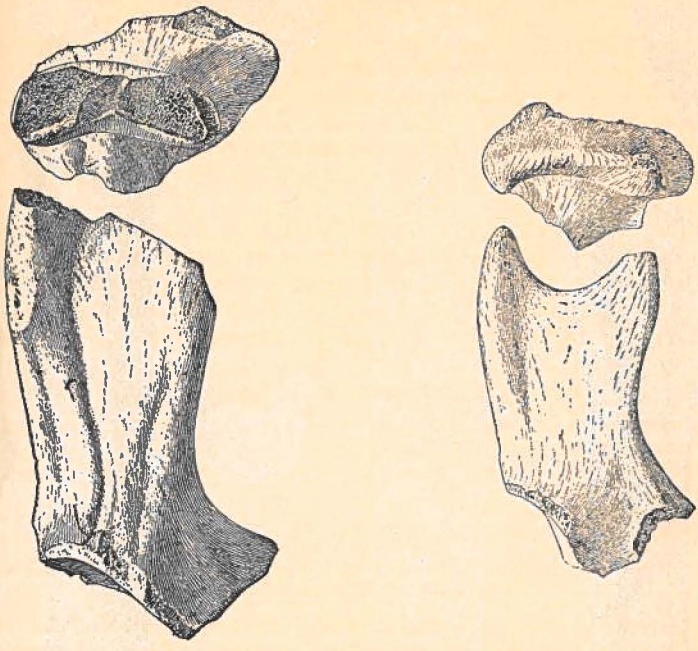
Sphenophalos nevadanus Merriam

Several specimens representing the bases of horn-cores of *Sphenophalos nevadanus* illustrate the typical characters of this species. Among these No. 22427 illustrates better than any specimen found up to this time the spreading type of horn with wedge-shaped cross-section, described in an earlier publication.[12] Unfortunately none of the known horn-cores show the summit. Nearly all of the specimens are broken off in much the same way and at nearly the same point, which suggests that there may have been a zone of weakness in this region, or that the bone above this point was of a somewhat different nature.

A small specimen, No. 22429 (fig. 13), less than half the size of the typical adult *Sphenophalos nevadanus*, shows a horn-core with a transversely flattened cross-section and a slight upward flare. At a distance above the base, somewhat less than twice the greatest width of this horn-corn, the upper region is noticeably constricted by an outer or lateral longitudinal groove beginning near the base of the horn and by a faint concavity of the upper end of the median side. The cross-section of the horn at this point is dumb-bell-like and the contour of the surface suggests a division into two terminal spikes or points of approximately equal size at a short distance above this section. There is a slight element of twist in this specimen which bends the anterior portion of the horn-core laterally or outward as in *Sphenophalos nevadanus*.

A third specimen, No. 22430 (fig. 14), represents a still younger animal with horn-core not more than half the size of that in No. 22429. In the smallest specimen the complete, strongly compressed, band-like horn-core has a length not more than one and one-half times its greatest width and terminates in two approximately equal points or spikes. The horn-core is slightly twisted and apparently the anterior spike is twisted outward.

[12] J. C. Merriam, Univ. Calif. Publ. Bull. Dept. Geol., vol. 5, p. 326, 1909; *ibid*, vol. 6, p. 286, 1911.



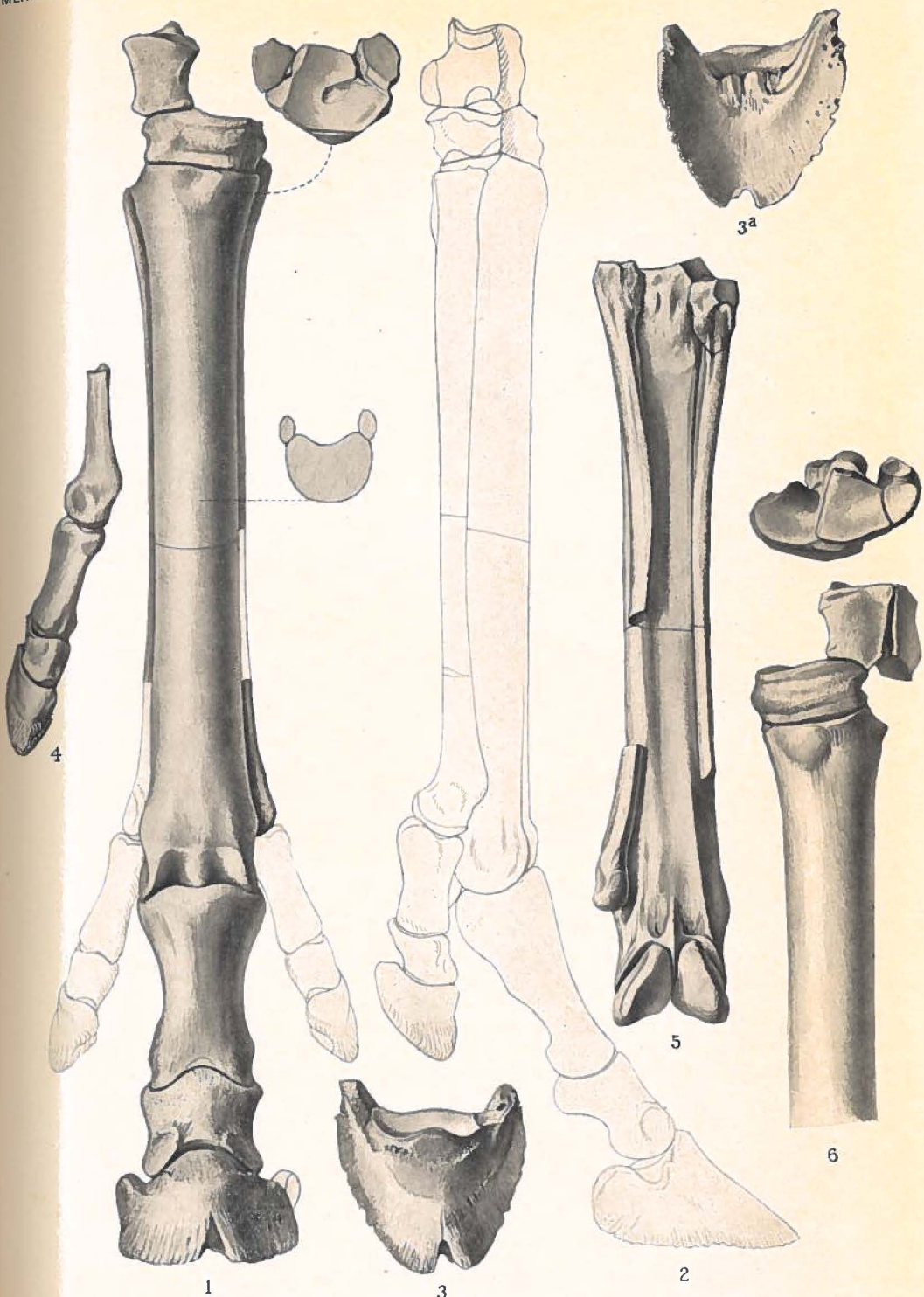
13 14

Figs. 13 and 14. *Sphenophalos nevadanus* Merriam. Horn-cores; ×1.0. Fig. 13, No. 22429 U. C. C.; fig. 14, No. 22430 U. C. C. Thousand Creek Pliocene, Nevada.

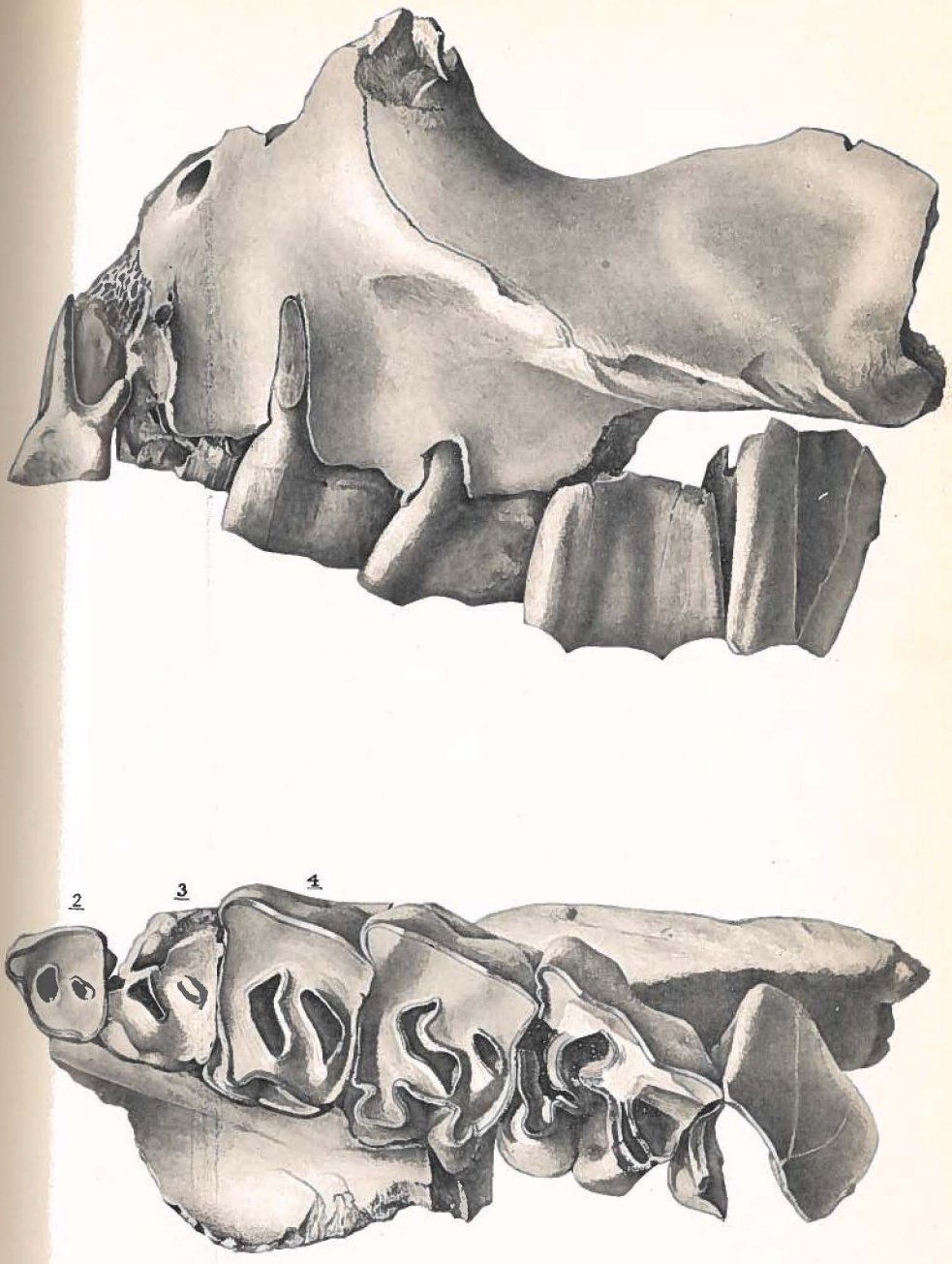
While the available material is insufficient to furnish full proof, it is certainly strongly suggested that the smaller specimens, Nos. 22430 and 22429, show a transition series illustrating the origin of the horn-core in *Sphenophalos nevadanus*. The smallest specimen may represent a young individual of *S. nevadanus* or might be a distinct but smaller species. It is not improbable that complete horns of *S. nevadanus* will be found comparatively short and may terminate in two small spikes.

Although the characters of *Sphenophalos* seem still quite distinct from those of *Ilingoceros* and the smallest horn-core, No. 22430, with complete, bifurcated tip is presumably nearest to *Sphenophalos*, this horn-core offers a suggestion as to origin of a previously described,[13] bizarre horn-core (No. 11893) with bifurcated tip and spirally twisted shaft. This peculiar specimen has been referred to *Ilingoceros* on account of its spiral shaft. The divided tip is possibly a heritage from a common ancestor of both *Sphenophalos* and *Ilingoceros*.

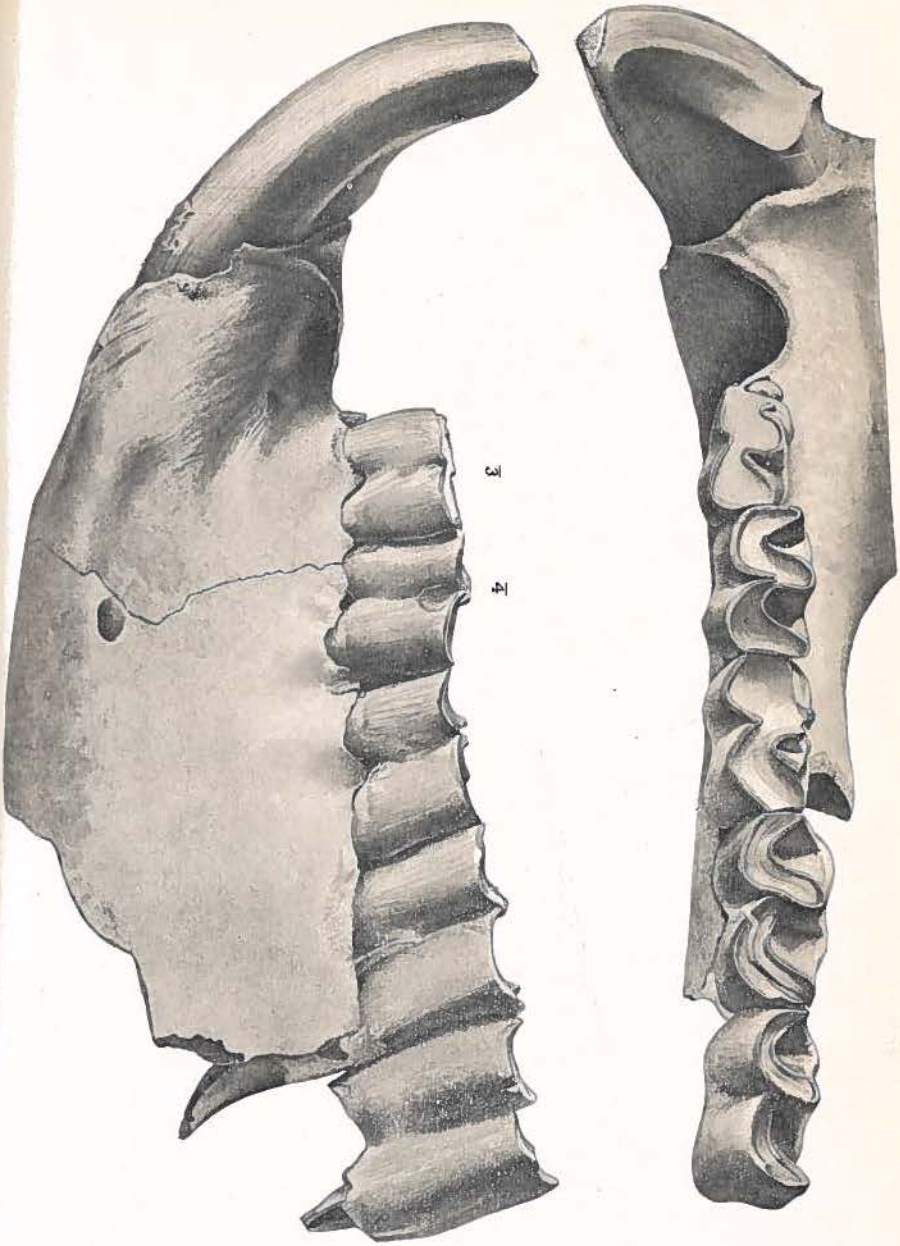
[13] J. C. Merriam, Univ. Calif. Publ. Bull. Dept. Geol., vol. 6, p. 293, figs. 73*a*, 73*b*, 1911.



Hipparion (*Neohipparion*) *leptode* Merriam. Front foot elements, No. 27126 University of California Collection. Thousand Creek Pliocene, Nevada. All figures ×0.50.



Teleoceras fossiger (Cope). Skull and superior dentition, No. 22901 University of California Collection. Thousand Creek Pliocene, Nevada. Lateral and inferior views, ×0.50.



Teleoceras fossiger (Cope). Mandibular ramus and inferior dentition, No. 22901 University of California Collection. Thousand Creek Pliocene, Nevada. Lateral and superior views, ×0.50.